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ABSTRACT

MeasureMetric is a school television/film series for fifth and sixth grade students which presents measurement and the metric system. The main goal of this test development effort was to produce a valid and reliable test usable by classroom teachers for measuring children's achievement of the objectives of the twelve 15-minute programs dealing with the measurement of four attributes--length, area, volume, and mass. The accomplishments of the test development team include (1) preparation of a valid and reliable written final test with answer sheet and instructions for administration; (2) preparation of four unit tests with answer sheets and instructions; and (3) preparation of a final performance test. Appendices include the first draft pilot study forms, final draft unit, and final tests with instructions and answer sheets. (Author/CMV)

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research report

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The Agency for Instructional Television is a nonprofit American-Canadian organization established in 1973 to strengthen education through television and other technologies. AIT develops joint program projects involving state and provincial agencies, and acquires and distributes a wide variety of television and related printed materials for use as major learning resources. It makes many of the television materials available in audiovisual formats. AIT's predecessor organization, National Instructional Television, was founded in 1962. The AIT main offices and Midwestern office are in Bloomington, Indiana; there also are regional offices in the Washington, D.C., Atlanta, and San Francisco areas.

This research is part of the "MeasureMetric" project, which consists of television/film programs and related materials for elementary students in the United States and Canada. This project is a joint effort of a consortium of educational and television agencies and the Agency for Instructional Television.

This test was conceived and written by John LeBlanc, Thomas Schroeder, and Randall Charles of the Math Education Development Center, Indiana University, and the research staff of the Agency for Instructional Television.

Research Report 56

MEASUREMETRIC TEST DEVELOPMENT

December 1977

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MEASUREMETRIC TEST DEVELOPMENT

Overview

"MeasureMetric" is a school television/film series for fifth and sixth grade students which presents measurement and the metric system. It is designed to teach students to estimate, to make measurements using appropriate measuring instruments, to record measurements using proper metric symbols, and to interpret measurements. Its twelve lessons deal with the measurement of four attributes--length, area, volume, and mass.

The "MeasureMetric" instructional package consists of twelve 15-minute television/film programs, a teacher's guide which suggests classroom preparation and program follow-up activities, and a comprehensive paper-and-pencil test. This report describes the test and its development.

The main goal of the "MeasureMetric" test development effort was to produce a valid and reliable test usable by classroom teachers for measuring children's achievement of the objectives of the "MeasureMetric" lessons. The accomplishments of the test development team include (1) preparation of a valid and reliable written final test with answer sheet and instructions for administration; (2) preparation of four Unit tests (length, area, volume, mass) with answer sheets and instructions; (3) preparation of a final performance test; and (4) preparation of questionnaires for assessing

teachers' classroom implentation of the "MeasureMetric" programs and lessons.

Preliminary Activities

Within the past five years, a large number of instructional materials have appeared related to measurement and the metric system. Prior to generating items for the test to accompany the "MeasureMetric" series, a review of existing materials was conducted with particular attention to the ways in which the materials' objectives had been assessed. At the same time, and throughout the process of writing and refining test items, special concern was paid to the stated objectives of the "MeasureMetric" series.

Generating Test Items

Since the test developed for the "MeasureMetric" series was to be one that could be used by the classroom teacher for assessing the achievement of an entire class of pupils, a paper-and-pencil test was thought to be most useful. The consortium had recommended this approach as the most likely to be adopted and used. However, it was clear that some of the objectives of the "MeasureMetric" series could not be assessed in this way. For example, several objectives state that the student is to demonstrate a measurement technique such as covering an object with a transparent grid to measure its area or placing an object in water to measure its volume. Obviously paper-and-pencil test items are not appropriate for assessing such abilities. The term "performance item" has been used to describe those items which require students to use an instrument or measuring process to make a measurement of an actual object and then to record the measurement

on paper. Both paper-and-pencil and performance items were constructed.

Two types of objectives were included in the list provided by the "MeasureMetric" series developers: enabling objectives (EOs) and terminal objectives (TOs). According to the program developers, the EOs are one which, if attained, facilitate the attainment of the TOs. Using the list of objectives, the test developers independently generated a collection of items where each item was intended to assess a particular EO or, in some instances, several EOs. Most of the items were written in multiple-choice or paper-and-pencil completion format; however, many performance items were also included.

After each had generated a collection of items, the three test developers met and exchanged items. The items were reviewed with respect to clarity and with respect to the congruency between an item and the EO or EOs with which it was associated. The list of EOs was also examined to determine EOs for which additional items were needed.

In most cases, several items were written to assess each EO. Since 85 EOs were included in the list of program objectives, there were indeed too many items for one 45- to 50-minute test. (A test that could be administered during one regular classroom period was sought.) Rather than discard a large number of items at this stage in the test development, several forms of a test were developed for a pilot study.

For each attribute included in the "MeasureMetric" series (length, area, volume-capacity, mass) three forms of a test were constructed. Each form contained 15 items, 13 of which were either multiple choice or paper-and-pencil completion and two of which were performance items. The tests for length and mass were combined to form three length-mass tests. Similarly, the tests for area and volume were combined to form three area-volume

tests. These six forms were used in the first-draft pilot study and are on file at AIT for those interested in seeing them. Related materials include a table listing each item and the EO for which it was written and details of the assignment of classes and test forms for the pilot study, described below.

First-Draft Pilot Study

The first-draft test forms were administered to fifth and sixth grade pupils in Illinois and the State of Washington, by arrangements made with local contacts. The classes were to be chosen to represent a range of socioeconomic levels (high, medium, low), and the pupils were to be those who had already done some study of measurement and the metric system. Each form was administered to about 70 or more pupils.

Pupils responded in booklets which contained one item per 8 1/2" by 5 1/2" page. This format facilitated the assembly of the test booklets and provided a presentation which would help the children focus on each item's task.

The analysis of the results of the first-draft pilot study was accomplished with the aid of an item analysis computer program. This program provided reliability estimates and test means and standard deviations for each form (refer to Appendix I). It also gave the proportion of students giving each coded response (d) and the correlation between each response and total score (R). Out of a total of 144 test items in the first draft item pool (42 length, 32 area, 43 volume, 27 mass), useful data were collected on a total of 132 items (39 length, 30 area, 39 volume, 24 mass), covering 65 EOs.

The reliability indices obtained in the range of 0.6 and above for the 30-item test forms, were seen as acceptable. The overall difficulty of

the tests was somewhat surprising and disappointing; each class mean score was less than 50%. There are, however, two facts which explain this poor showing. First, follow-up telephone calls to several of the teachers who administered the tests revealed that none of the classes had done extensive work with measurement and the metric system recently. Second, group mean scores tend to be deflated by scores of zero on items that pupils were told to omit. In most of the classes, one or more of the items could not be administered for lack of apparatus and/or time to prepare for the administration of the performance items.

The D and R values for each item (and in the case of multiple choice items, each answer choice) were used as a basis for refining the item pool. The D values showed which items were hard and which were easy and indicated which item distractors were and were not working. The R values provided information about the discriminatory power of the items and item choices and pointed out distractors that might be misleading or confusing. In refining the item pool content validity was insured by rechecking the congruency between each item and the EOs and TOs related to it.

Second Draft Construction

A pool of more than 120 revised items remained after analyzing the results of the first draft pilot study and editing the items. Not all of these items could be included in one 45-minute test, nor could the 65 EOs represented by them be assessed in a test of that length. Some criteria were needed for selecting EOs to be assessed and the items for doing so. It was also clear that decisions needed to be made about the nature, format, and length of the test(s). Questions such as the following were raised: Should there be one final test, or unit tests on length, area, volume and

mass? Should the tests be exclusively paper-and-pencil, or should there be performance items or separate performance tests?

To resolve these questions, the test construction consultants met with the program series developers. Decisions were:

(1) A single form of final test should be prepared. It should cover all four attributes with 40 items in multiple choice and completion formats. It should cover the most important EOs. This test, to be produced as a test booklet with separate answer sheet, was designated Final Test/Written (FT/W).

(2) Four unit tests for length, area, volume, and mass should also be constructed. These tests would assess a wider range of EOs than the FT/W, and could be used for formative evaluation, as supplements to FT/W in summative evaluation, or as diagnostic tools to aid teachers in producing effective classroom lessons. These tests of 15 items each should contain both paper-and-pencil and performance items, and should be produced as a test booklet with separate answer sheets. These tests were designated UT/L, UT/A, UT/V, and UT/M.

(3) One 10-item final performance test covering length, area, volume, and mass should be constructed. This test would be used to supplement the FT/W by assessing performance objectives. This test was designated FT/P.

(4) Dr. Marilyn Suydam, instructional developer for the "Measure-Metric" series, accepted the task of selecting the EOs to be assessed in the FT/W and recommending the items from the pool appropriate for doing so. Final editing and assembly of the tests was to be the task of the test construction consultants.

Table 1 below shows the number of items related to each attribute contained in the FT/W and FT/P.

TABLE 1

NUMBER OF ITEMS RELATED TO EACH ATTRIBUTE CONTAINED IN FINAL TESTS

	Length	Area	Volume	Mass
FT/W	8	10	15	7
FT/P	2	4	2	2

Table 2 below shows the relationship between the items of FT/W and the EOs. Note that 43 different EOs are assessed. Copies of this draft of the final written test are also on file and available to interested persons. Unit tests are included in Appendix II.

TABLE 2

RELATIONSHIP BETWEEN ITEMS OF FT/W AND ENABLING OBJECTIVES (EOs)

Item #		Enabling Objective
1.	L/1.1	Given a choice of metric measuring instruments, the student will select an appropriate instrument to measure an object more than 3 metres in length.
2.	L/1.2	Given a choice of calibrated metric measuring instruments, the student will select an instrument calibrated in (a) decimetres, (b) centimetres, or (c) millimetres, to measure an object less than one metre in length.
3.	L/1.3	Given a length/distance, the student will select the appropriate unit for measuring it: kilometre, metre, centimetre, or millimetre.
4.	L/2.1	Given an instrument to measure length and an object to be measured, the student will carefully align the zero point of the instrument with one end of the object.
5.	L/2.6	Given a length to estimate, the student will use a referent in estimating the length.
6.	L/3.1	Upon completing a linear measurement, the student will (a) read, (b) record, and (c) report, the result of the measurement using a numeral and the appropriate metric symbol (km, m, dm, cm, mm).
7.	L/4.1	Given the multiples and submultiples of a metre, the student will demonstrate an understanding of the interrelationships between the common units by stating that: 1 km = 1000 m; 1 m = 0.001 km 1 dm = 0.1 m; 1 m = 10 dm 1 cm = 0.01 m; 1 m = 100 cm 1 mm = 0.001 m; 1 m = 1000 mm 1 dm = 10 cm; 1 cm = 0.1 dm 1 cm = 10 mm; 1 mm = 0.1 cm 1 dm = 100 mm; 1 mm = 0.01 dm
8.	L/4.2	Upon completion of a measurement, the student will state it in terms of a metric equivalent (e.g., 161 cm = 16.1 dm; 1.34 m = 134 cm).
9.	A/1.1	Given a rectangular region, the student will recognize area as being two dimensional.
10.	A/1.2	Given a rectangular region, the student will recognize that area and perimeter differ.

TABLE 2, continued

Item #		Enabling Objective
11.	A/2.2	Given a rectangular region and a choice of techniques (covering, using a grid, using a formula), the student will select a technique for determining the area.
12.	A/2.3	Given the metric units km^2, m^2, dm^2, and cm^2, and a rectangular region, the student will select a unit of appropriate size for determining the area.
13.	A/3.4	Given a rectangular region partitioned into (a) square centimetres and (b) square decimetres, the student will count the number of squares to determine the area.
14.	A/3.5	Given a rectangular region, the student will estimate its size by using a referent.
15.	A/3.1	Given a rectangular region and unit square (a) cm^2, (b) dm^2, and (c) m^2, the student will use the squares to cover the region and count the number of squares to determine the area.
16.	A/3.6	Given a partitioned rectangular region, the student will determine the area of the region by multiplying the number of rows by the number of columns.
17.	A/4.2	Upon determining the area of given rectangular region, the student will correctly state the area; for example, (1) read "3 dm^2" as "3 square decimetres," not as "3 decimetres squared," which is $(3\ dm)^2$; (2) "six square decimetres" does <u>not</u> mean the same as "a six decimetre square."
	A/5.1	Given two measurement descriptions stated in the form "six square decimetres" and "a six decimetre square," the student will distinguish between the two by making appropriate sketches.
18.	A/4.2	Upon determining the area of a given rectangular region, the student will correctly state the area; for example, (1) read "3 dm^2" as "3 square decimetres," not as "3 decimetres squared," which is $(3\ dm)^2$; (2) "six square decimetres" does <u>not</u> mean the same as a "six decimetre square."
	A/5.2	Given (a) cm^2 and dm^2, and (b) dm^2 and m^2, the student will illustrate the relationship between successive area unit by superimposing: (a) cm^2 on dm^2, and (b) dm^2 on m^2.

TABLE 2, continued

Item #		Enabling Objective
19.	V_i/2.4	Given a quantity of a liquid or granular substance, the student will estimate its volume using a referent.
20.	V_i/2.5	Given a quantity of liquid or granular substance and a container graduated in (a) l, (b) ml, and (c) l and ml, the student will pour the liquid or substance into the container and will read the measurement as being: (1) between units, (2) to the nearest unit.
21.	V_i/2.6	Given a gauge or dial, such as on a gas meter, a gasoline pump, or a water meter, the student will determine the volume measured by reading the gauge or dial.
22.	V_i/4.1	Given ml and l, the student will demonstrate an understanding of the relationship between them by stating: 1 l = 1000 ml; 1 ml = 0.001 l
23.	V/1.2	Given a rectangular sold and a choice of techniques (layering, displacement, using a formula), the student will select a technique for determining the volume.
24.	V_i/1.1	Given a quantity of liquid or granular substance and a selection of containers the student will select a container(s) of an appropriate size to measure the volume of the liquid or granular substance.
25.	V/1.3	Given the metric units cm^3, dm^3, and m^3 and a rectangular solid, the student will select a unit of appropriate size for determining the volume.
26.	V/2.2	Given a rectangular solid on which layering with the cubes cm^3 or dm^3 is illustrated, the student will count the number of cubes in one layer, count the number of layers, and compute the total volume.
	V/2.4	Given a rectangular solid on which the results of layering with cubes are illustrated, the student will count the number of rows, columns, and layers, and then multiply those numbers to determine the volume.
27.	V/2.6	Given a rectangular solid and the measurements for its length, width, and height, the student will use the formula V = l x w x h to compute its volume.
28.	V/2.8	Given a rectangular solid, the student will estimate its volume by using a referent.

TABLE 2, continued

Item #		Enabling Objective
29.	V/3.4(2)	Upon determining the measurement of a given volume, the student will correctly communicate the volume measurement; for example, "six cubic centimetres" does not mean the same as a "six centimetre cube."
	V/4.6	Given two measurement descriptions stated in the form "six cubic decimetres" and a "six decimetre cube," the student will distinguish between the two by making appropriate sketches.
30.	V/4.1	Given ml, l, kl, cm^3, dm^3, and m^3, the student will demonstrate an understanding of the interrelationships by stating that: 1 l = 1 dm^3; 1 dm^3 = 1000 cm^3; 1 m^3 = 1000 dm^3; 1 cm^3 = 1 ml; 1 l = 1000 ml; 1 m^3 = 1 kl; 1 kl = 1000 l
31.	V/4.3	Given the symbols m, m^2, and m^3, the student will demonstrate an understanding of the symbol meanings by making a sketch by stating that the units are used for measuring one-, two-, and three-dimensional objects.
32.	V/4.4	Given the symbols cm^3, dm^3, and m^3, the student will demonstrate an understanding of the symbol meanings by making a sketch showing their relative sizes.
33.	M/1.2	Given two different objects with the same mass, the student will recognize that the volumes could be different and that it is necessary to measure to compare their volumes.
34.	M/2.2	Given an object and the metric units g, kg, and t, the student will select a unit of appropriate size for determining the measurement of the mass.
35.	M/3.2	Given two objects and an equal arm balance, the student will compare their masses by using the balance.
36.	M/3.3	Given an object and a beam balance, the student will measure the mass by using the balance and reading the scale on the balance.
	M/4.1	Upon determining the measurement of an object's mass, the student will (a) read, (b) record, and (c) report the result of the measurement by using a numeral and the appropriate metric unit symbol (g, kg, t).

TABLE 2, continued

Item #		Enabling Objective
37.	M/3.4	Given an object and a dial scale, the student will measure the mass and read the dial.
38.	M/3.5	Given an object, the student will estimate its mass by using a referent.
39.	M/5.1	Given the units (a) dm^3, kg, ℓ, and (b) cm^3, g, mℓ, the student will interpret the relationships by stating: (1) 1 dm^3 of water has a mass of 1 kg and a volume of 1 ℓ (2) 1 cm^3 of water has a mass of 1 g and a volume of 1 mℓ
40.	M/5.2	Given g, mg, kg, and t, the student will demonstrate an understanding of the interrelationships by stating that: 1 g = 1000, 1 kg = 1000 g; 1 t = 1000 kg.

Second-Draft Pilot Study

The second-draft final test (FT/W) was studied by administering it to five sixth grade classes in Iowa City, Iowa. Although these classes had not used the "MeasureMetric" series, they had received well-planned instruction in metric measurement, in a program initiated several months before the test was administered on a posttest basis.

The purposes of the second pilot study were to obtain a measure of reliability for the 40-item paper and pencil FT/W and to obtain selected statistics (e.g., item difficulty) for each test item. Table 3 shows the statistics obtained for the 40-item test.

TABLE 3

RESULTS OF SECOND DRAFT PILOT STUDY

Mean (max=40)	21.82
SD	6.58
Mean Item Difficulty	.55
Mean Item to Total Correlation	.30
Alpha	.83

Since most classroom tests have a reliability coefficient between 0.60 and 0.80, the developers considered a reliability coefficient of .83 to be quite acceptable. However, the mean item difficulty, 0.55, was still undesirably low (i.e., the test was too difficult). An examination of the eleven items which had D-values of less than 0.40 revealed that these items correspond closely to the EOs that they are intended to assess. Therefore although these items proved to be difficult, they were retained in the test because of their high content validity. It should be noted that these items measure concepts and skills known to be difficult for children. None of these items were judged to be confusing or misleading in form or style.

The final editing of the test as a whole involved only a few minor modifications in verbal expressions and in illustrations. The order of four items was changed because it was felt that instructions in some items might give away answers to other items. The revised final written test and its answer sheet and instructions are contained in Appendix III.

APPENDICES

APPENDIX I

FIRST-DRAFT PILOT STUDY FORMS: NUMBER OF CASES, TEST MEANS, TEST STANDARD DERIVATIONS, RELIABILITY ESTIMATES, AND STANDARD ERRORS OF ESTIMATE[1]

Form	N				Test Mean	Test S.D.	Reliability		S.E.M.	
	Total	Hi SES[2]	Med SES[2]	Low SES[2]			K-R[3]	S-B[4]	K-R[5]	S-B[6]
LM/A	70	25	15	30	13.46	4.29	0.72	0.81	2.28	1.89
LM/B	75	26	29	20	11.61	3.61	0.60	0.60	2.29	2.29
LM/C	66	26	20	20	8.85	3.87	0.66	0.64	2.24	2.32
AV/A	66	23	18	25	10.56	3.94	0.67	0.64	2.26	2.35
AV/B	79	23	28	28	8.30	3.37	0.60	0.58	2.14	2.19
AV/C	77	26	22	29	7.18	3.91	0.70	0.70	2.15	2.13

[1]The data given in this table were obtained in the following manner. Pupils responded to the test items by writing their answers in the test booklets. Temporary clerical help hired by AIT coded these responses onto optical scanning sheets which were fed into the DIGITAT test item analysis program at the Indiana University Bureau of Educational Studies and Testing. A spot check of the coders' work translating pupil responses onto optical scanning sheets revealed a satisfactory level of accuracy.

[2]High, medium, and low SES levels were levels attributed to the schools by the local contact person.

[3]K-R reliability estimates are those given by the DIGITAT program using the Kuder-Richardson formula 20 method. (Details avaliable from Bureau of Educational Studies and Testing, Indiana University, Bloomington.)

[4]S-B reliability estimates are those given by the DIGITAT program using the Spearman-Brown method.

[5]K-R S.E.M. is the standard error of estimate calculated from the K-R reliability estimate and the standard deviation of observed test scores.

[6]S-B S.E.M. is the standard error of estimate calculated from the S-B reliability estimate and standard deviation of observed test scores.

APPENDIX II

UNIT TESTS, instructions, and answer sheets

A. Length

B. Mass

C. Volume

D. Area

MEASUREMETRIC TEST UT/L

The purpose of this unit test is to assist in evaluating and diagnosing a student's understanding of length and its measurement in metric units. It is one of a number of aids for the classroom teacher, to be used in conjunction with the television programs and other in-class activities. It is not a standardized or norm-referenced test instrument. Included in this package are:

- a test
- an answer sheet
- an answer key

Guidelines for Test Administration

Performance Items

There are three performance items included on this test (items 13, 14, and 15). These are activities that students are asked to carry out in the classroom. Because items 13 and 15 ask for the measurement of objects unique to an individual classroom, the teacher must supply the correct answer. Students may complete performance tasks individually or in small groups. Several measuring devices and objects are required to perform these activities:

a trundle wheel and cord taped to the floor
a metric ruler
a metre stick, marked in decimetres

Time

This test is designed to take about 20 minutes or less. It is suggested that students be allowed as much time as they need, but you may wish to impose a 20-minute time limit.

Answer Sheet

A separate answer sheet is provided for this test, to be used if you wish. If answers are to be recorded on the answer sheet, students should not mark or write in the test booklet. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

Most of the questions are in multiple choice format. These questions are answered by choosing an answer from among the suggested answers given and circling the letter of the choice on the answer sheet.

Some questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Answering the Questions

For each question there is only one best answer. Students sometimes wonder whether they should guess when they are not certain of the correct answer. This question should be answered as follows. If you have no idea of the correct answer to a question, it is best to skip that question and go on to the next one. If you think you have a good idea of the correct answer but are not certain, it is best to give the answer you think is correct.

1. Which is best for measuring the length of a basketball court?

   A. 1 m stick

   B. 30 cm ruler

   C. 2 m measuring tape

   D. trundle wheel

2. Which is best for measuring the distance around your waist?

   A. 1 m stick

   B. 30 cm ruler

   C. 2 m measuring tape

   D. calipers

3. What unit is best for measuring the thickness of a penny?

A. mm

B. cm

C. m

D. km

4. Which picture shows the correct way to measure the distance around the glass jar?

A.

B.

C.

D.

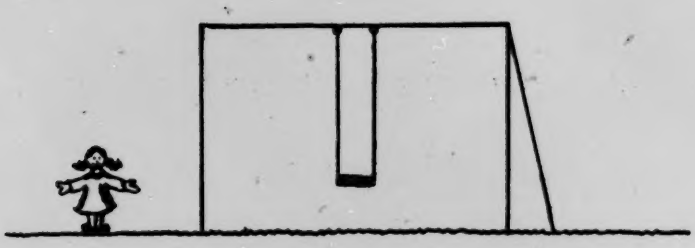
5. Which is closest to 1 cm?

   A. the distance across a quarter (25-cent coin)

   B. the distance across a popsicle stick

   C. the thickness of a penny

   D. the distance across your hand



6. Susie is 125 cm tall. About how high is the top of her swing set?

   A. 150 cm

   B. 300 cm

   C. 450 cm

   D. 700 cm

7. John used a 1 m stick to measure the length of an object. The end of the object was close to the 26 mark on the stick. About how long is the object?

   A. 26 m

   B. 26 dm

   C. 26 cm

   D. 26 mm

8. Jane used a trundle wheel to measure the length of the playground fence. She heard 34 clicks. About how long is the fence?

   A. 34 km

   B. 34 m

   C. 34 cm

   D. 34 mm

9. Which one is correct?

A. 10 mm = 1 cm

B. 10 cm = 1 mm

C. 10 dm = 1 cm

D. 10 mm = 1 dm

10. Complete this sentence to make it true:

1 km = _____ m

11. Which one is correct?

A. 1 cm = 0.1 m

B. 1 cm = 0.1 mm

C. 1 cm = 0.01 m

D. 1 m = 0.01 cm

12. Which of these is a way of writing 2.50 m?

A. 250 mm

B. 250 dm

C. 25.0 cm

D. 250 cm

13. Use a trundle wheel to measure the length of the cord taped to the floor. Record your answer using the proper metric symbol.

Answer _____

14. Use a ruler to measure the length of the nail shown in the picture to the nearest mm. Record your answer using the proper metric symbol.

Answer _____

15. Measure the height of your teacher's desk to the nearest dm. Record your answer using the proper metric symbol.

Answer _____

ANSWER KEY
LENGTH

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C (D)

2. A B (C) D

3. (A) B C D

4. A B (C) D

5. A (B) C D

6. A (B) C D

7. A B (C) D

8. A (B) C D

9. (A) B C D

10. 1,000 m

11. A B (C) D

12. A B C (D)

13. (teacher answers)

14. 60 or 61 mm

15. (teacher answers)

LENGTH

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C D

2. A B C D

3. A B C D

4. A B C D

5. A B C D

6. A B C D

7. A B C D

8. A B C D

9. A B C D

10. _____

11. A B C D

12. A B C D

13. _____

14. _____

15. _____

MEASUREMETRIC TEST UT/M

The purpose of this unit test is to assist in evaluating and diagnosing a student's understanding of mass and its measurement in metric units. It is one of a number of aids for the classroom teacher, to be used in conjunction with the television programs and other in-class activities. It is not a standardized or norm-referenced test instrument. Included in this package are:

- a test
- an answer sheet
- an answer key

Performance Items

There are three performance items included on this test (items 13, 14, and 15). These are activities that students are asked to carry out in the classroom. Students may complete performance tasks individually or in small groups. Two measuring devices are required to perform these activities:

a beam balance
a metric bathroom scale

Time

This test is designed to take about 20 minutes or less. It is suggested that students be allowed as much time as they need, but you may wish to impose a 20-minute time limit.

Answer Sheet

A separate answer sheet is provided for this test, to be used if you wish. If answers are to be recorded on the answer sheet, students should not mark or write in the test booklet. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

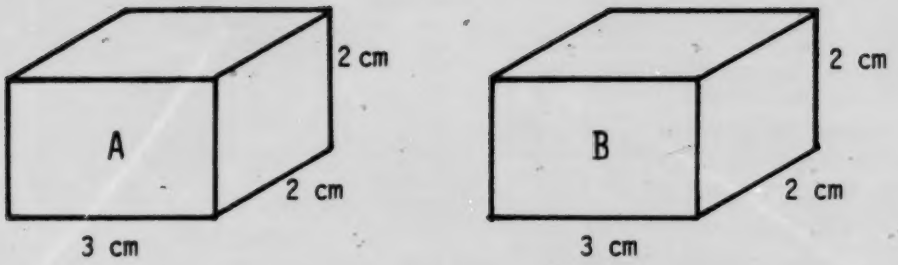
Most of the questions are in multiple choice format. These questions are answered by choosing an answer from among the suggested answers given and circling the letter of the choice on the answer sheet.

Some questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Answering the Questions

For each question there is only one best answer. Students sometimes wonder whether they should guess when they are not certain of the correct answer. This question should be answered as follows. If you have no idea of the correct answer to a question, it is best to skip that question and go on to the next one. If you think you have a good idea of the correct answer but are not certain, it is best to give the answer you think is correct.

If there is more time left at the end of the test, students may go back to questions they may have skipped previously.



1. Block A has a volume of 12 cm^3. Block B has a volume of 12 cm^3. Which one is true about the mass of the blocks?

   A. A is heavier than B.

   B. B is heavier than A.

   C. A and B have the same mass.

   D. You can't tell unless you weigh them.

2. Which unit would you use to weigh yourself?

   A. g

   B. kg

   C. cm

   D. t

PICTURE A

PICTURE B

3. Picture A shows Tim weighing himself and Tim weighing his dog. Picture B shows Tim holding his dog on the scale. Which one is true?

   A. The mass of Tim holding his dog is greater than the mass of Tim plus the mass of his dog.

   B. The mass of Tim holding his dog is less than the mass of Tim plus the mass of his dog.

   C. The mass of Tim holding his dog is equal to the mass of Tim plus the mass of his dog.

   D. You can't tell.

4. Which of these is closest to the mass of an empty soup can?

   A. 2 g

   B. 20 g

   C. 200 g

   D. 2000 g

5. Block A weighs 40 g. Block B weighs 40 g. Which one is true?

   A. A and B have the same volume because they have the same mass.

   B. You have to measure to see if A and B have the same volume.

   C. A and B have about the same volume.

   D. A and B have different volumes.

6. Which unit is best for telling the mass of a school bus?

   A. kg

   B. g

   C. t

   D. km

7. About how much do you weigh?

   A. between 1 g and 100 g

   B. between 1 kg and 20 kg

   C. between 20 kg and 50 kg

   D. between 80 kg and 100 kg

8. 1 cm^3 of water has a mass of

   A. 1 kg

   B. 100 g

   C. 1 g

   D. 10 kg

9. 1 dm^3 of water has a mass of

   A. 1 kg

   B. 100 g

   C. 1 g

   D. 10 kg

10. 1 cm^3 is the same as

   A. 1 mℓ

   B. 10 dm^3

   C. 1 ℓ

   D. 10 mm^3

11. Which one is correct?

A. 1 g = 100 mg

B. 1 t = 1000 kg

C. 1 kg = 100 g

D. 1000 t = 1 kg

12. Which one is correct?

A. 1 g = 1000 mg

B. 1 mg = 1000 g

C. 1 kg = 1000 mg

D. 1 g = 100 mg

13. Use the beam balance to find out how much a new pencil weighs.

Answer _____

14. Find the mass of the bottle using the beam balance.

Answer _____

15. Use the metric bathroom scale to find how much you weigh.

Answer _____

ANSWER KEY

MASS

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C (D)

2. A (B) C D

3. A B (C) D

4. A B (C) D

5. A (B) C D

6. A B (C) D

7. A B (C) D

8. A B (C) D

9. (A) B C D

10. (A) B C D

11. A (B) C D

12. (A) B C D

13. (teacher answers)

14. (teacher answers)

15. _____

MASS

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C D

2. A B C D

3. A B C D

4. A B C D

5. A B C D

6. A B C D

7. A B C D

8. A B C D

9. A B C D

10. A B C D

11. A B C D

12. A B C D

13. _____

14. _____

15. _____

MEASUREMETRIC TEST UT/V

The purpose of this unit test is to assist in evaluating and diagnosing a student's understanding of volume and its measurement in metric units. It is one of a number of aids for the classroom teacher, to be used in conjunction with the programs and other in-class activities. It is not a standardized or norm-referenced test instrument. Included in this package are:

- a test
- an answer sheet
- an answer key

Performance Items

There are three performance items included on this test (items 12, 14, and 15). Because these items ask for the measurement of objects unique to an individual classroom, the teacher must supply the correct answer. Students may complete performance tasks individually or in small groups. Several measuring devices and objects are required:

a 1 metre stick
cm^3 blocks
a small box
a soft drink or other bottle
a graduated container

Time

This test is designed to take about 20 minutes or less. It is suggested that students be allowed as much time as they need, but you may wish to impose a 20-minute time limit.

Answer Sheet

A separate answer sheet is provided for this test, to be used if you wish. If answers are to be recorded on the answer sheet, students should not mark or write in the test booklet. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

Most of the questions are in multiple choice format. These questions are answered by choosing an answer from among the suggested answers given and circling the letter of the choice on the answer sheet.

Some questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Answering the Questions

For each question there is only one best answer. Students sometimes wonder whether they should guess when they are not certain of the correct answer. This question should be answered as follows. If you have no idea of the correct answer to a question, it is best to skip that question and go on to the next one. If you think you have a good idea of the correct answer but are not certain, it is best to give the answer you think is correct.

If there is more time left at the end of the test, students may go back to questions they may have skipped previously.

1. John wants to measure how much water he can put in a bathtub.

   Which container should he use to fill the bathtub?

   A. a 100 mℓ container

   B. a 10 ℓ container

   C. a 100 ℓ container

   D. a 1 kℓ container

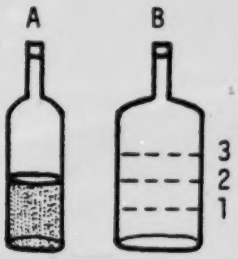
2. Which unit is best for telling the amount of paint in a can?

   A. mℓ

   B. ℓ

   C. kℓ

   D. m



3. Amy is going to pour the water from bottle A into bottle B.

   About how high will the water come in bottle B?

   A. It will come to about mark 1.

   B. It will come to about mark 2.

   C. It will come to about mark 3.

   D. You can't tell how high it will come.

4. Which one holds about 1 ℓ?

   A. a spoon

   B. garbage can

   C. bathtub

   D. jar of peanut butter

5. Which one is correct?

   A. 1 mℓ = 0.001 ℓ

   B. 1 mℓ = 1000 ℓ

   C. 1 mℓ = 0.01 ℓ

   D. 1 mℓ = 0.1 kℓ

6. What unit is best for telling the volume of your classroom?

   A. cm^3

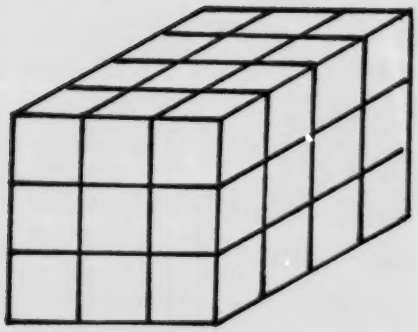
   B. dm^3

   C. m^3

   D. mℓ

7. A box of cereal is 3 cm wide, 8 cm long, and 10 cm high. What is the volume of the box?

Answer _____



8. A. Each cub is 1 cm^3. Find the length, width, and height of the block.

length = _____; width = _____;

height = _____.

B. Find the volume of the block. Write your answer using the proper metric symbol.

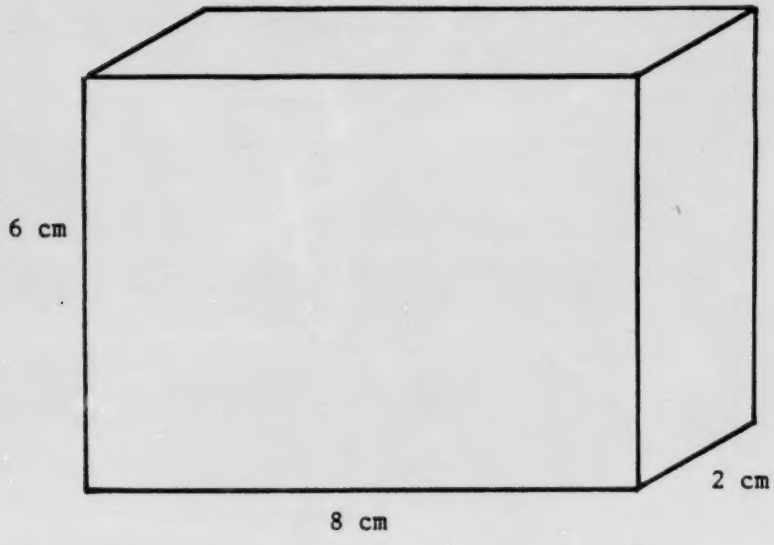
Answer _____

9. A. Find the length, width, and height of the box.

length=_____; width=_____; height=_____.

B. Find the volume of the box.

Answer _____



10. Which one is correct?

A. 1000 m^3 = 1 dm^3

B. 1000 dm^3 = 1 m^3

C. 10 dm^3 = 1 m^3

D. 10 m^3 = 10 dm^3

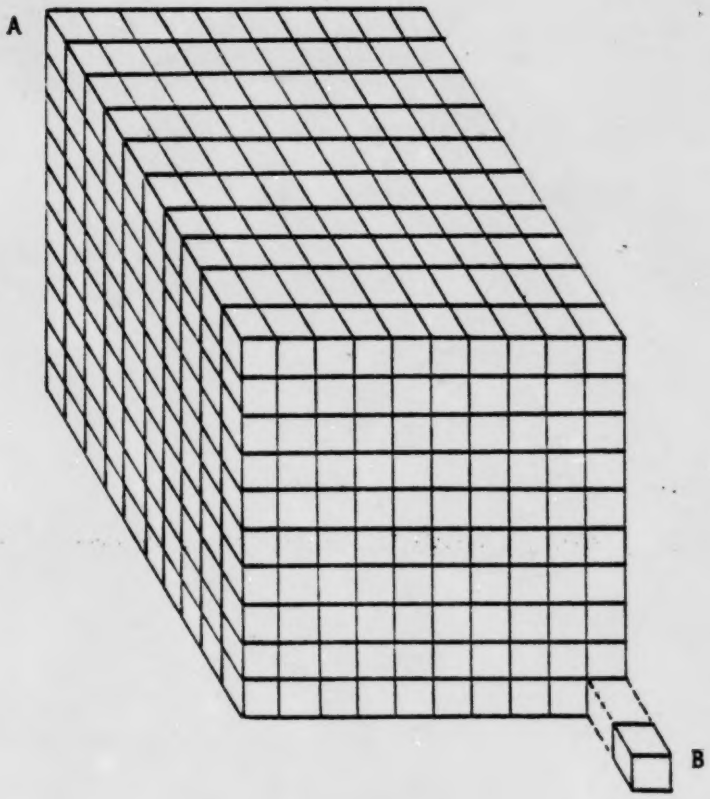
11. Block A is 1 dm^3. What is Block B?

A. 0.1 dm^3

B. 1 mm^3

C. 1 cm^3

D. 0.01 dm^3



12. A. Use a 1 m stick. Find the length, width, and height of this classroom.

length = _____; width = _____;

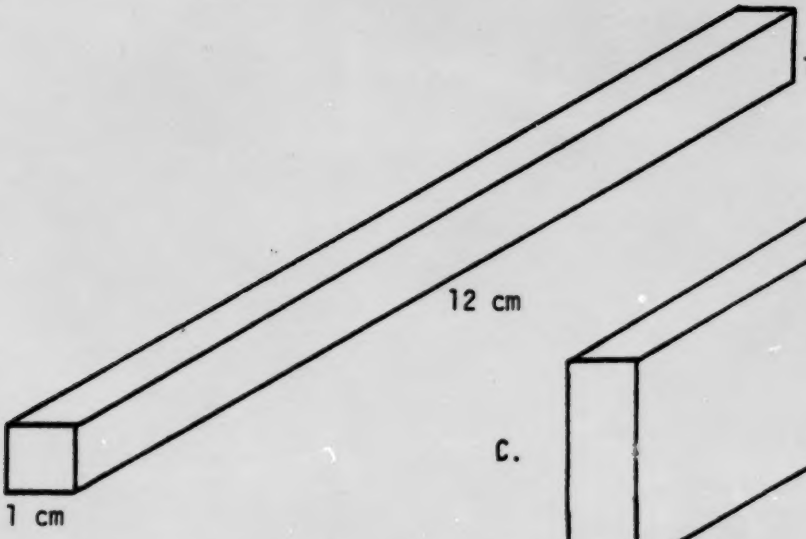
height = _____.

B. Find the volume of this classroom.

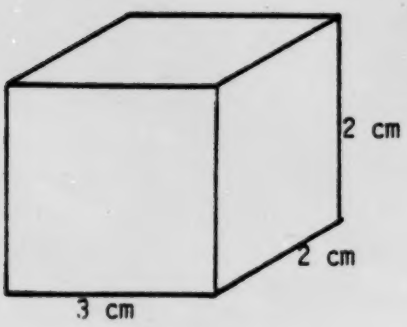
Answer _____

13. Which one does <u>not</u> have a volume of 12 cm^3?

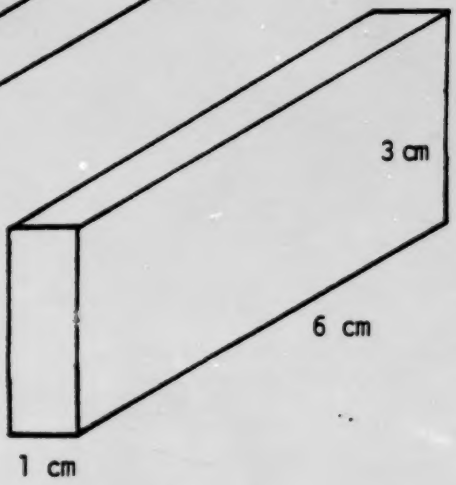
A.



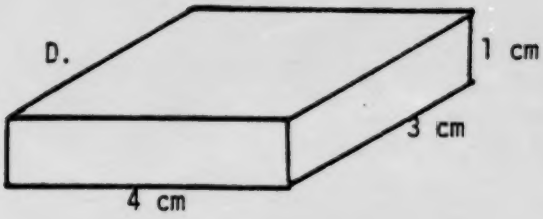
B.



C.



D.



14. Use the cm^3 blocks to find the volume of the box.

15. Find how much water the bottle will hold. Fill it to the very top!

Answer _____

ANSWER KEY
VOLUME

MEASUREMETRIC ACHIEVEMENT TEST

1. A (B) C D

2. A (B) C D

3. (A) B C D

4. A B C (D)

5. (A) B C D

6. A B (C) D

7. 240 cm^3

8. A. length = 4 cm ; width = 3 cm ; height = 3 cm .
   B. 36 cm^3

9. A. length = 8 cm ; width = 2 cm ; height = 6 cm .
   B. 96 cm^3

10. A (B) C D

11. A B (C) D

12. A. length = _____ ; width = _____ ; height = _____ .
    B. _____

(teacher answers)

13. A B (C) D

14. (teacher answers)

15. (teacher answers)

VOLUME

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C D

2. A B C D

3. A B C D

4. A B C D

5. A B C D

6. A B C D

7. _____

8. A. length = _____; width = _____; height = _____.
   B. _____

9. A. length = _____; width = _____; height = _____.
   B. _____

10. A B C D

11. A B C D

12. A. length = _____; width = _____; height = _____.
    B. _____

13. A B C D

14. _____

15. _____

MEASUREMETRIC TEST UT/A

The purpose of this unit test is to assist in evaluating and diagnosing a student's understanding of area and its measurement in metric units. It is one of a number of aids to the classroom teacher, to be used in conjunction with the programs and other in-class activities. It is not a standardized or norm-referenced test instrument. Included in this package are:

- a test
- an anser sheet
- an answer key

Performance Items

There are three performance items included on this test (items 13, 14, and 15). These are activities that students are asked to carry out in the classroom. Students may complete performance tasks individually or in small groups. Two measuring devices are required to perform these activities:

a metric ruler
a clear plastic cm^2 grid

Time

This test is designed to take about 20 minutes or less. It is suggested that students be allowed as much time as they need, but you may wish to impose a 20-minute time limit.

Answer Sheet

A separate answer sheet is provided for this test, to be used if you wish. If answers are to be recorded on the answer sheet, students should not mark or write in the test booklet. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

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Some questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Answering the Questions

For each question there is only one best answer. Students sometimes wonder whether they should guess when they are not certain of the correct answer. This question should be answered as follows. If you have no idea of the correct answer to a question, it is best to skip that question and go on to the next one. If you think you have a good idea of the correct answer but are not certain, it is best to give the answer you think is correct.

If there is more time left at the end of the test, students may go back to questions they may have skipped previously.

1. Susan measured the area of a book cover using a ruler. What unit is best for telling the area of the book cover?

   A. cm

   B. cm^2

   C. cm^3

   D. dm

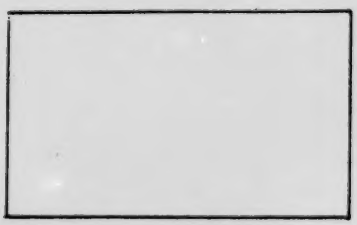
2. Which unit is best for finding the area of the rectangle?

   A.

   B.

   C.

   D.



3. What unit is best for finding the area of the floor of your classroom?

   A. km^2

   B. m^2

   C. dm^2

   D. cm^2

4. What unit is best for finding the area of a postage stamp?

   A. km^2

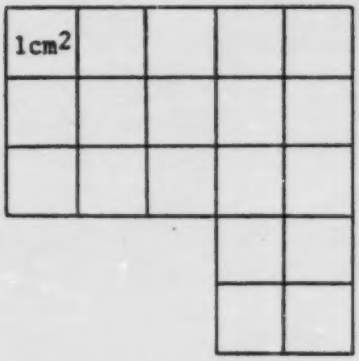
   B. m^2

   C. dm^2

   D. mm^2

5. Count the unit squares to find the area of the figure.

Record your answer using the proper metric symbol.



Answer _____

6. Which is closest in area to 1 m^2?

A. this sheet of paper

B. a postcard

C. a table top

D. an ordinary television screen

7. Which is closest in area to 100 cm^2?

   A. a page in a newspaper

   B. your hand

   C. a postage stamp

   D. a flower garden

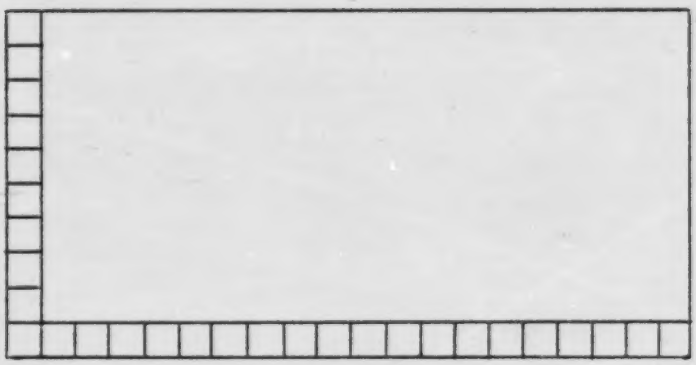
8. Find the area of the rectangle. Each small square stands for 1 cm^2.

   A. 200 cm^2

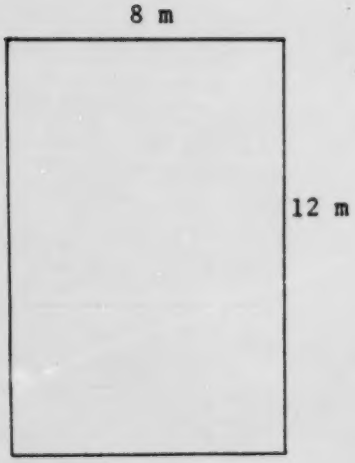
   B. 29 cm

   C. 56 cm^2

   D. 190 cm^2



9. What is the area of the rectangle?



A. 40 m^2

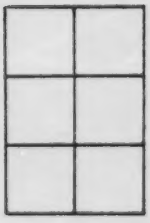
B. 20 m^2

C. 96 m^2

D. 96 km^2

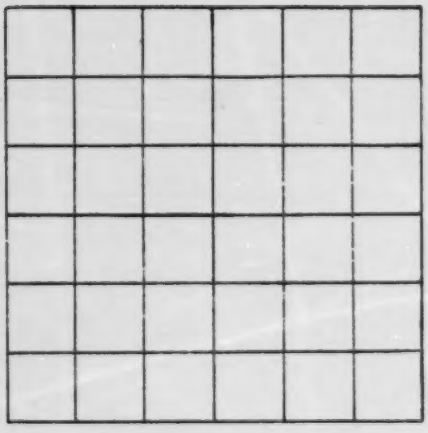
10. Which of these is <u>not</u> 6 cm^2?

A.



B.

C.



D.

11. Which one is correct?

A. $10\ dm^2 = 1\ m^2$

B. $100\ dm^2 = 1\ m^2$

C. $100\ cm^2 = 1\ m^2$

D. $1000\ cm^2 = 1\ m^2$

12. Which one is correct?

A. $10\ cm^2 = 1\ dm^2$

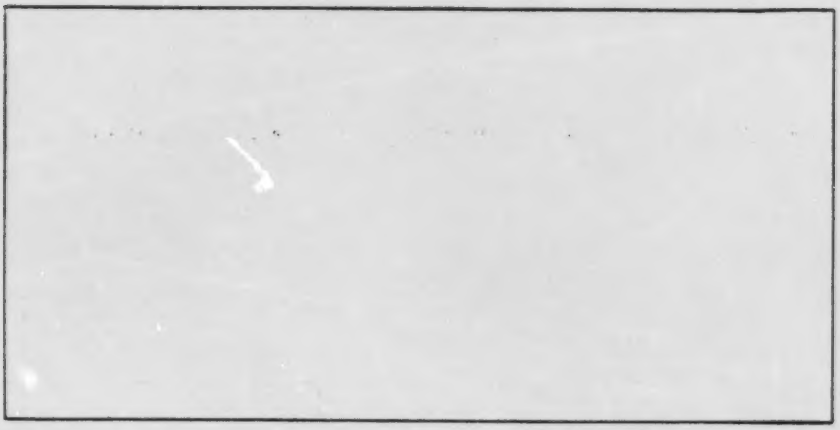
B. $10\ dm^2 = 1\ cm^2$

C. $100\ dm^2 = 1\ cm^2$

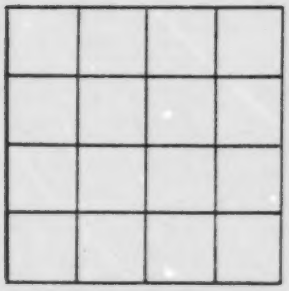
D. $100\ cm^2 = 1\ dm^2$

13. Use your ruler to find the area of the rectangle. Record your answer using the proper metric symbol.

Answer _____



14. This square has an area of 16 cm^2. Draw two rectangles which have the same area but a different shape.



15. Use the clear plastic cm^2 grid to help you. The area of this figure is about:

A. 10 cm^2

B. 28 cm^2

C. 15 cm^2

D. It doesn't have an area.

ANSWER KEY

AREA

MEASUREMETRIC ACHIEVEMENT TEST

1. A (B) C D

2. A B (C) D

3. A (B) C D

4. A B C (D)

5. 19 cm^2

6. A B (C) D

7. A (B) C D

8. (A) B C D

9. A B (C) D

10. A B (C) D

11. A (B) C D

12. A B C (D)

13. 72 cm^2

14.

15. (A) B C D

AREA

MEASUREMETRIC ACHIEVEMENT TEST

1. A B C D

2. A B C D

3. A B C D

4. A B C D

5. _____

6. A B C D

7. A B C D

8. A B C D

9. A B C D

10. A B C D

11. A B C D

12. A B C D

13. _____

14.

15. A B C D

APPENDIX III

Final Test Written

Final Test Performance

(plus instructions and answer sheets)

MEASUREMETRIC TEST FT/W

The purpose of this test is to assist in evaluating a student's understanding of metric measurement. It may be used prior to viewing and participating in the "MeasureMetric" series or as a final test, at the series' conclusion. Its questions cover all four concepts--length, area, volume, and mass--and can provide information on each. (Length questions are 1 - 8; area, 9 - 18; volume, 19 - 32; mass, 33 - 40.) The test is not a standardized or norm-referenced test instrument; it is intended to be one of a number of aids to the classroom teacher, to be used in conjunction with the programs and other in-class activities. Included in this package are:

- a test
- an answer sheet
- an answer key

Guidelines for Administering the Test

Time

This test is designed to take about 45 minutes or less. It is suggested that students be allowed as much time as they need, but you may wish to impose a 45-minute time limit.

Answer Sheet

A separate answer sheet is provided for use with this test, as you wish. If answers are to be recorded on the answer sheet, students should not mark or write in the test booklet. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

Most of the questions are in multiple choice format. These questions are answered by choosing an answer from among the suggested answers given and circling the letter of the choice on the answer sheet.

Some questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Answering the Questions

For each question there is only one best answer. Students sometimes wonder whether they should guess when they are not certain of the correct answer. This question should be answered as follows. If you have no idea of the correct answer to a question, it is best to skip that question and go on to the next one. If you think you have a good idea of the correct answer but are not certain, it is best to give the answer you think is correct.

If there is more time left at the end of the test, students may go back to questions they may have skipped previously.

1. Which is best for measuring the length of the chalkboard?

   A. caliper

   B. 100 cm^2 grid

   C. 30 cm ruler

   D. 1 m stick

2. Which is best for measuring the length of a nail?

   A. 2 m measuring tape

   B. trundle wheel

   C. 30 cm ruler

   D. I m stick

3. What unit is best for telling the distance that a school bus travels each school day?

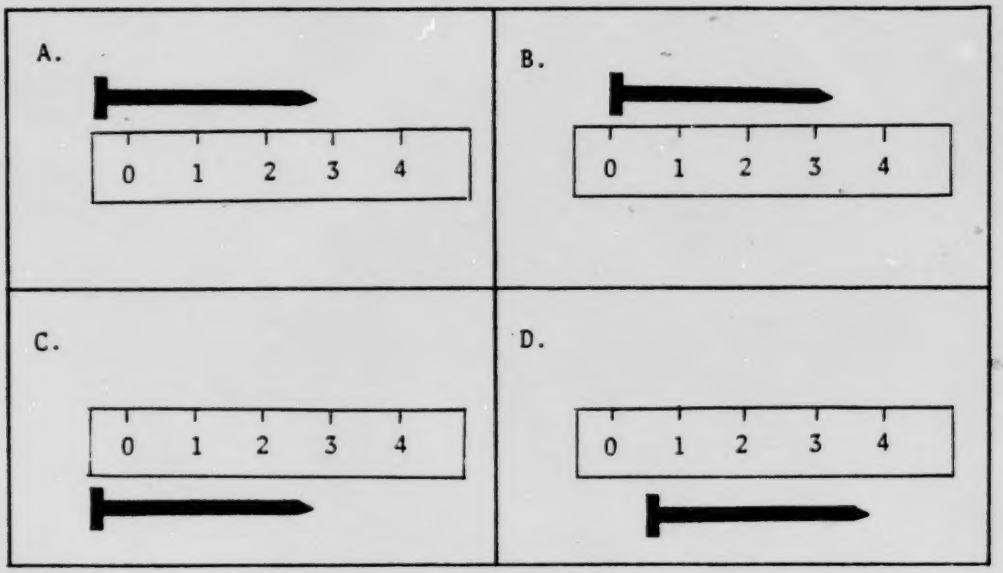
   A. km

   B. m

   C. cm

   D. mm

4. Which picture shows the correct way to measure the length of a nail?



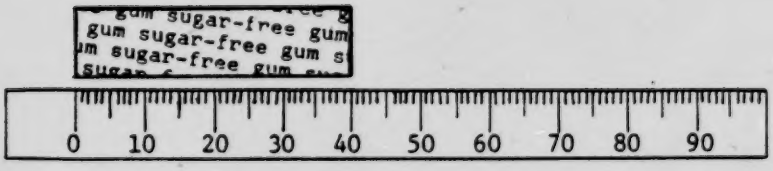
5. This paper clip is 1 cm wide. About how long is it?

A. 2 cm

B. 4 cm

C. 6 cm

D. 8 cm



6. About how long is this stick of gum?

A. 40 m

B. 40 dm

C. 40 cm

D. 40 mm

7. Complete this sentence to make it true.

1 m = _____ mm

8. Tim lives 2.3 km from school. Janice lives 2300 m from school. Which one of these is true?

A. Tim lives farther from school than Janice.

B. Janice lives farther from school than Tim.

C. Janice lives 1000 times as far from school as Tim.

D. Tim and Janice live the same distance from school.

9. If you want to measure the area of a rectangle using a ruler, how many measurements must you make?

   A. 1

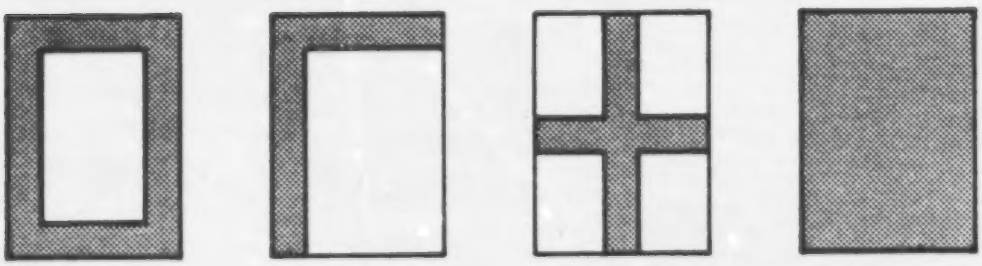
   B. 2

   C. 3

   D. 4

10. In the four drawings below different parts of a rectangle are shaded. Which one shows what is measured when you measure the area of the rectangle?

A. B. C. D.



11. Which of these is <u>not</u> a correct way to find the area of a rectangle?

    A. Cover it with squares of the same size.

    B. Place a grid on it.

    C. Add 2 times the length and 2 times the width.

    D. Multiply the length times the width.

12. What unit is best for telling the area of a postcard?

    A. km^2

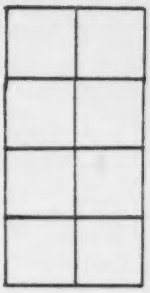
    B. m^2

    C. cm^2

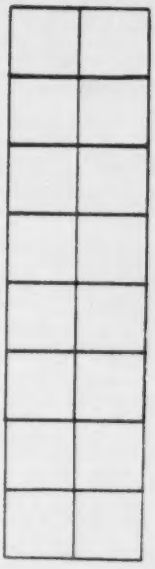
    D. mm^2

13. Which of these shows 8 cm^2?

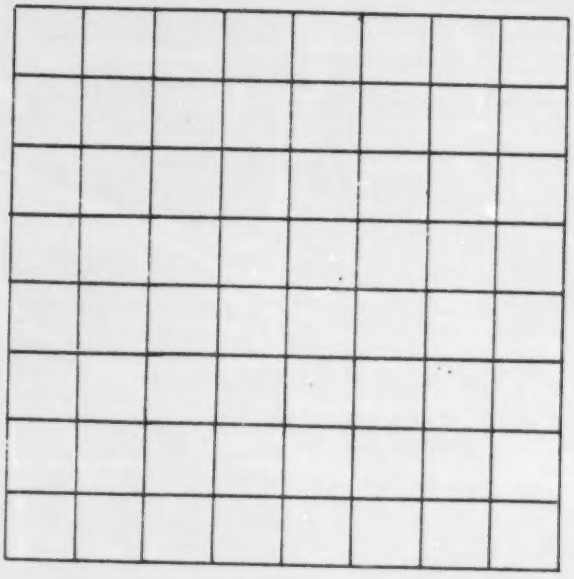
A.



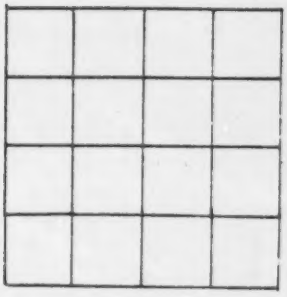
B.



C.



D.



14. Which is closest to the size of 1 cm^2?

A. the top of a card table

B. a slice of bread

C. your thumbnail

D. two football fields.

15. Barbara found the area of her desk top by covering it with squares that were 1 dm by 1 dm. She used 3 rows of squares with 4 squares in each row. What was the area of her desk top?

    A. 7 dm^2

    B. 12 dm^2

    C. 14 dm^2

    D. 16 dm^2

16. A rectangular wall is covered with 18 rows of square tiles. There are 25 columns of tiles. Which of these will <u>not</u> give the correct area of the wall?

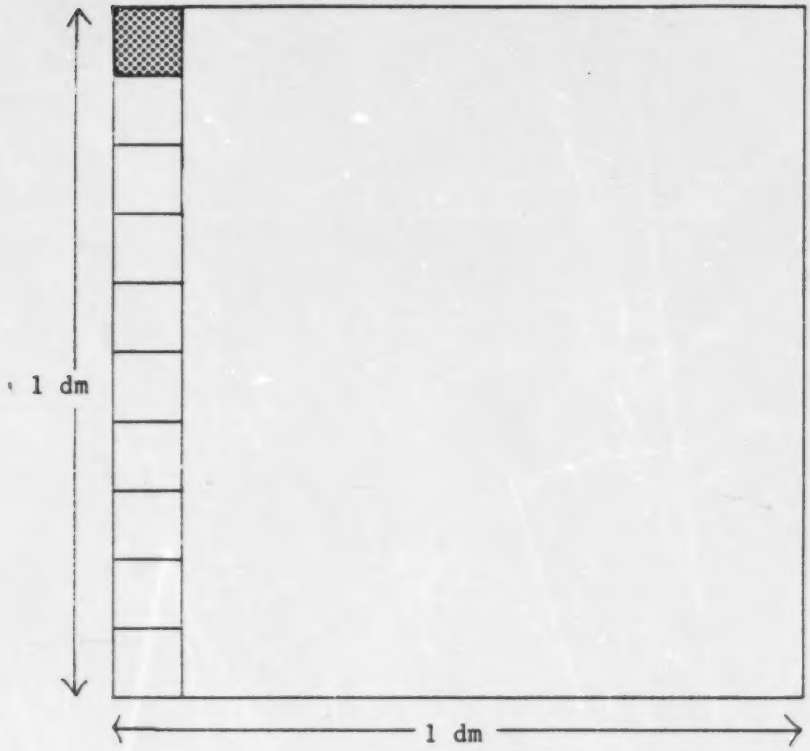
    A. Add the number of rows and the number of columns.

    B. Multiply the number of rows by the number of columns.

    C. Multiply the length of the wall by the width of the wall.

    D. Add the number in each row as many times as the number in each column.

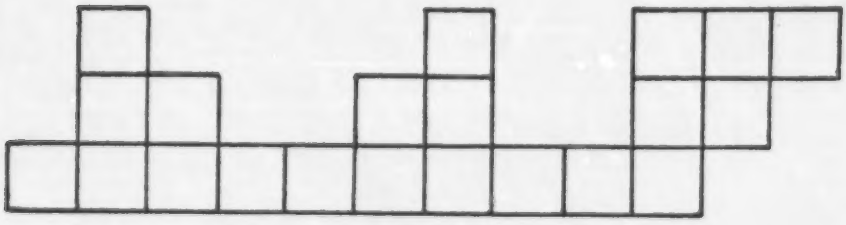
17. What unit of measurement is represented by the shaded square?



Answer _____

18. This figure has been divided into squares which are 1 cm by 1 cm. What is the area of the figure? Record your answer using the proper metric symbol.

Answer _____



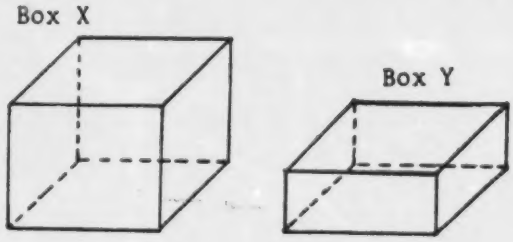
19. Box X holds about 1ℓ. Box Y holds about

A. 100 mℓ

B. 500 mℓ

C. 1000 mℓ

D. 1 ℓ



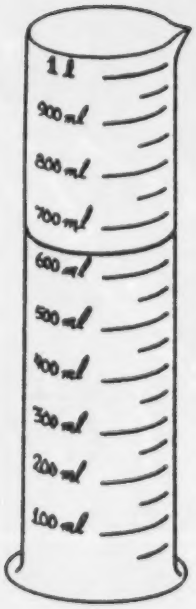
20. About how much water is in this container?

A. 1 ℓ

B. 650 mℓ

C. 600 mℓ

D. 700 mℓ



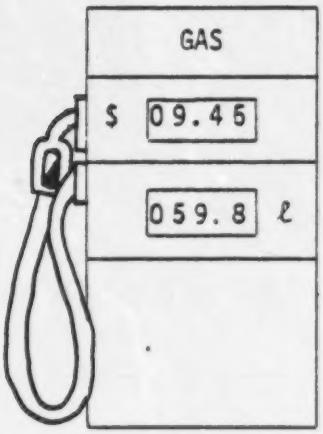
21. What was the volume of the gasoline Mr. Jones bought?

A. 9.45 ℓ

B. 945 ℓ

C. 59.8 ℓ

D. 598 ℓ



22. Which one is correct?

A. 1 ℓ = 1000 mℓ

B. 1 mℓ = 1000 ℓ

C. 1 ℓ = 100 mℓ

D. 1 mℓ = 0.1 kℓ

23. Which of these is not a correct way to find the volume of a block of metal?

    A. Multiply the length times the width times the height.

    B. Cover all of its sides with squares of the same size.

    C. Put it into a measuring container part full of water and see how much the water rises.

    D. Use cubes to make a model of the block.

24. Which measuring container is best for measuring the amount of milk in a glass?

    A. a 500 mℓ container

    B. a 5ℓ container

    C. a 50ℓ container

    D. a 5 kℓ container

25. What unit is best for telling the volume of a slice of bread?

A. dm^3

B. g

C. m^3

D. cm^3

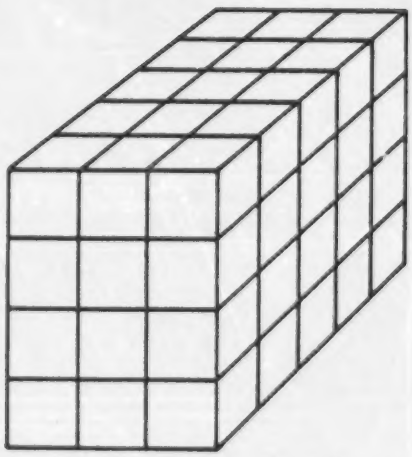
26. What is the volume of the rectangular solid shown below? (Each cube is 1 cm^3.)

A. 47 cm^3

B. 15 cm^3

C. 12 cm^3

D. 60 cm^3



27. Bill's father built a "clubhouse" that could hold five boys. Its height is 2 m, its width is 2 m, and its length is 3 m. What is the volume of the "clubhouse"?

A. 6 m^2

B. 6 m^3

C. 12 m^3

D. 30 m^3

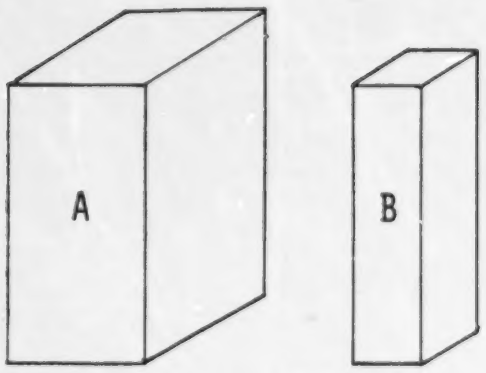
28. The volume of Block A is 16 cm^3. The volume of Block B is about

A. 12 cm^3

B. 8 cm^3

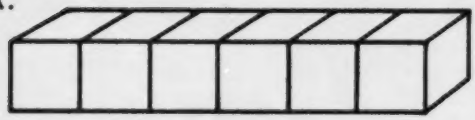
C. 4 cm^3

D. 2 cm^3

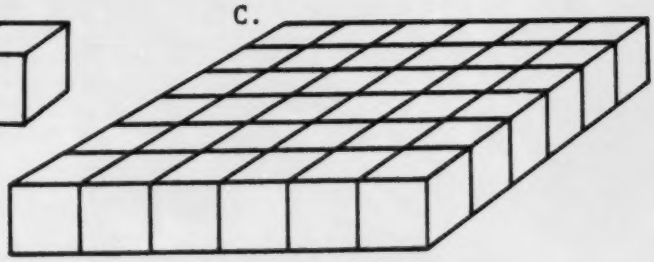


29. Which of these represents 6 cm^3?

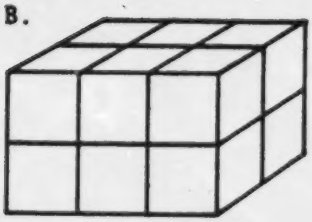
A.



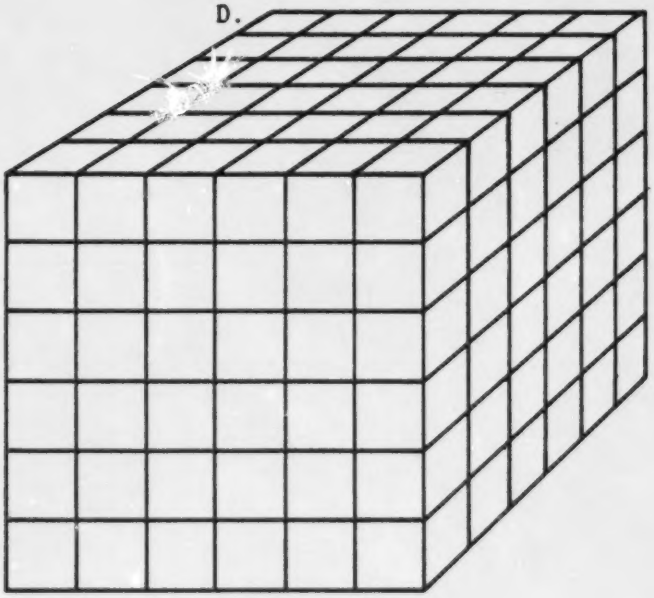
C.



B.



D.



30. Which one is correct?

A. 1000 dm^3 = 1 cm^3

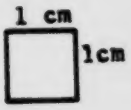
B. 1000 cm^3 = 1 dm^3

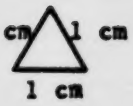
C. 10 cm^3 = 1 dm^3

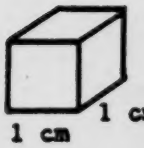
D. 10 dm^3 = 1 cm^3

31. Which picture shows 1 cm^3?

A.

B. 

C. 

D. 

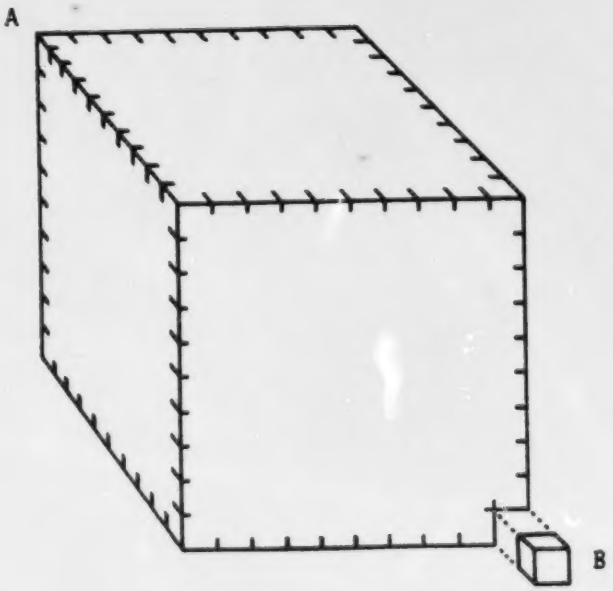
32. Block A is 1 m^3. What is Block B?

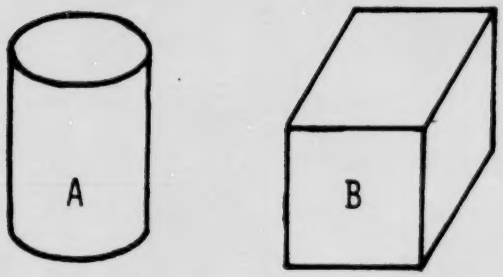
A. 1 dm^3

B. 1 cm^3

C. 0.1 m^3

D. 0.01 m^3





33. Block A weighs 40 g. Block B weighs 40 g. Which is true about the volumes of the two blocks?

A. The volume of A is greater than the volume of B.

B. The volume of B is greater than the volume of A.

C. A and B have exactly the same volume.

D. You can't tell if they have the same volume or not.

34. What unit would you use to weigh a dime?

A. g

B. kg

C. t

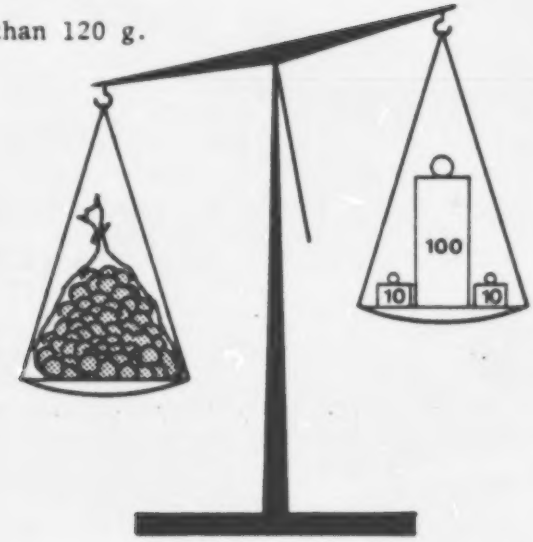
D. ℓ

35. How much does this candy weigh?

A. It weighs 120 g.

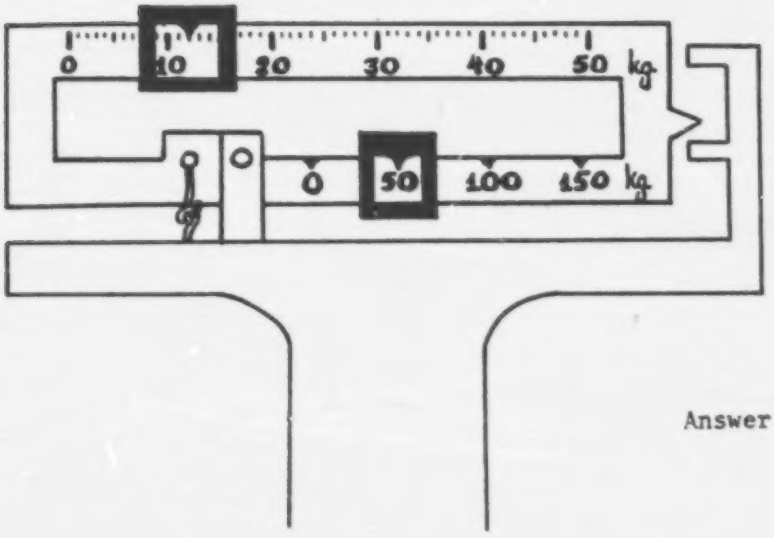
B. It weighs more than 120 g.

C. It weighs less than 120 g.



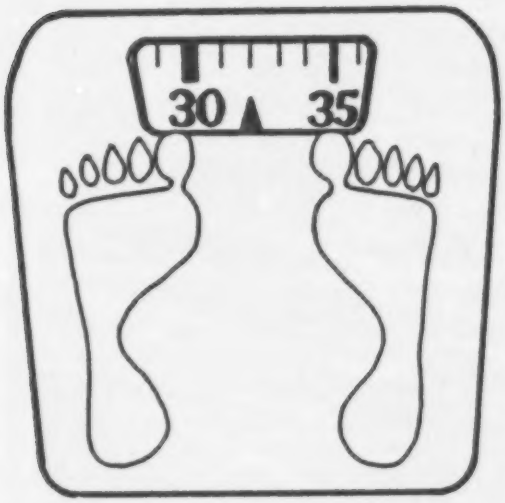
36. This is what Pete sees when he is on the doctor's scale.

How much does Pete weigh?



Answer _____

37. A person is standing on this metric bathroom scale. How much does the person weigh?



Answer _____

38. About how much does a hamburger weigh?

A. about 1 g

B. about 5 g

C. about 100 g

D. about 1 kg

39. Which one is true?

A. 1 mℓ of water weighs 1 kg.

B. 1 ℓ of water is 1 cm^3 of water.

C. 1 ℓ of water weighs 1 g.

D. 1 cm^3 of water weighs 1 g.

40. Which one is true?

A. 10 g = 1 kg

B. 100 g = 1 kg

C. 1000 g = 1 kg

D. 1000 t = 1 kg

MEASUREMETRIC TEST ANSWER SHEET

ANSWER KEY

ame _____

Grade _____

eacher's Name _____

ity & State _____

. A B C (D)

. A B (C) D

. (A) B C D

. A (B) C D

. A B (C) D

. A B C (D)

. 1 m = 1000 mm.

. A B C (D)

LENGTH

. A (B) C D

0. A B C (D)

1. A B (C) D

2. A B (C) D

13. (A) B C D

14. A B (C) D

15. A (B) C D

16. (A) B C D

17. cm^2

18. 21 cm^2

AREA

19. A (B) C D

20. A (B) C D

21. A B (C) D

22. (A) B C D

23. A (B) C D

24. (A) B C D

25. A B C (D)

26. A B C (D)

FT/W

27. A B (C) D

28. A B (C) D

29. (A) B C D

30. A (B) C D

31. A B C (D)

32. (A) B C D

VOLUME

33. A B C (D)

34. (A) B C D

35. A (B) C D

36. 62 kg

37. 32 kg

38. A B (C) D

39. A B C (D)

40. A B (C) D

MASS

MEASUREMETRIC TEST ANSWER SHEET

me _____

ade _____

acher's Name _____

ty & State _____

A B C D

A B C D

A B C D

A B C D

A B C D

A B C D

l m = _____ mm.

A B C D

A B C D

A B C D

B C D

B C D

13. A B C D

14. A B C D

15. A B C D

16. A B C D

17. _____

18. _____

19. A B C D

20. A B C D

21. A B C D

22. A B C D

23. A B C D

24. A B C D

25. A B C D

26. A B C D

27. A B C D

28. A B C D

29. A B C D

30. A B C D

31. A B C D

32. A B C D

33. A B C D

34. A B C D

35. A B C D

36. _____

37. _____

38. A B C D

39. A B C D

40. A B C D

MEASUREMETRIC TEST FT/P

The purpose of this unit test is to assist in evaluating and diagnosing a student's understanding of four measurement concepts--length, area, volume, and mass--and their measurement in metric units. It may be used as part of a final evaluation with the final written test (FT/W). The test is not a standardized or norm-referenced test instrument; it is intended to be one of a number of aids to the classroom teacher, to be used in conjurction with the programs and other in-class activities. Included in this package are:

- a test
- an answer sheet
- an answer key

This test is made up entirely of performance items: activities that students are asked to carry out in the classroom. Because items 1, 7, 8, 9, and 10 ask for the measurement of objects unique to an individual classroom, the teacher must supply the correct answer. Students may complete performance items individually or in small groups. Several measuring devices and objects are required to perform these activities:

a trundle wheel and cord taped to the floor
a metric ruler
1 cm by 1 cm squares
a clear plastic cm^2 grid
an equal arm balance
a graduated container
a small milk carton
a beam balance
a small rock
water

Time

This test is designed to take about 20 minutes. It is suggested that students be allowed as much time as they need, but you may wish to impose a 20-minute time limit.

Answer Sheet

A separate answer sheet is provided for use with this test, as you wish. If answers are to be recorded on the answer sheet, students should not mark or write on the test. Students should record all their answers in pencil. If a student decides to change an answer, all incorrect answers should be erased completely.

Most of the questions require the student to supply an answer. Spaces are provided on the answer sheet for the student to write in his/her answer.

Some of the questions are in multiple choice format. These questions are answered by choosing an answer from among the suggested answers given and circling the letter of the choice on the answer sheet.

1. Use a 1 m stick to measure the length of the cord taped to the floor.

Answer _____

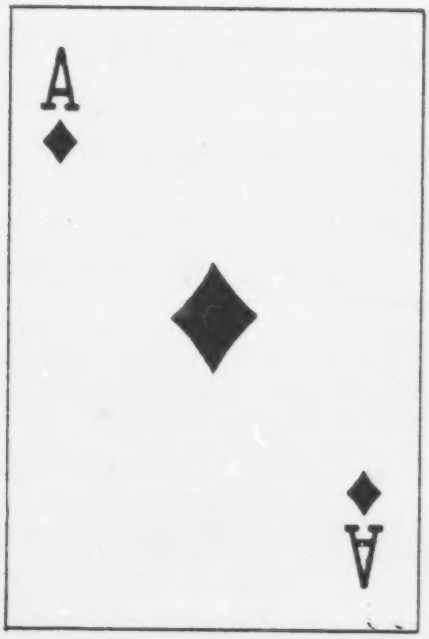
2. Use a ruler to measure the length of this pencil to the nearest cm.

Answer _____

3. Use the 1 cm by 1 cm squares to find the area of the picture of the gum. Record your answer using the proper metric symbol.

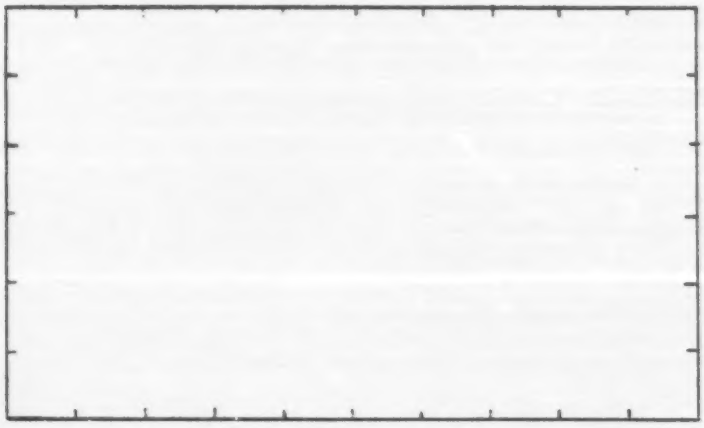
Answer _____

4. Use the clear plastic cm^2 grid to find the area of the playing card. Record your answer using the proper metric symbol.



Answer _____

5. Use your ruler to make a grid on this figure. Find the area. Record your answer using the proper metric symbol.



Answer _____

6. Use your ruler. Find the area of this rectangle. Record your answer using the proper metric symbol.

Answer _____

7. Use the equal-arm balance to find which is heavier, the can or the bottle.

   A. The can is heavier.

   B. The bottle is heavier.

   C. They weigh the same.

   D. I couldn't tell.

8. Use water and a measuring container to find the volume of the piece of rock.

Answer _____

9. A. Find the length, width, and height of the milk carton.

length _____; height _____; width _____

B. Find the volume of the milk carton.

Answer _____

10. Use the beam balance to find how much the rock weighs.

Answer _____

PERFORMANCE

MEASUREMETRIC ACHIEVEMENT TEST

ANSWER KEY

1. (teacher answers)

2. 13 or 14 cm

3. 16 cm^2

4. 54 cm^2

5. 60 cm^2

6. 15 cm^2

7. A B C D (teacher answers)

8. (teacher answers)

9. A. length = _____; width = _____; height = _____.

   B. _____

(teacher answers)

10. (teacher answers)

PERFORMANCE

MEASUREMETRIC ACHIEVEMENT TEST

1. _____

2. _____

3. _____

4. _____

5. _____

6. _____

7. A B C D

8. _____

9. A. length = _____; width = _____; height = _____.

   B. _____

10. _____

AIT RESEARCH PUBLICATIONS

This publications list includes research reports from AIT and its predecessor organizations, NITL, NCSCT, and NIT. Most of these reports were distributed widely. However, some were written for internal documentation and are generally unavailable to a larger audience. Many of the out-of-print reports (marked with an asterisk) are available through the ERIC system. Other materials may be obtained from AIT and from the ERIC system (ED numbers are included for such reports).

The Evaluation of Instructional Television. NITL, December 1963.*

The Status of Instructional Television. NITL, March 1964.*

An Assessment of Instructional Television: 1966-1968. $2.00 per set, .40 each (ED 083 800)
Instructional Television in Art Education
Instructional Television in Music Education
Instructional Television in Foreign Language Education
Television in Health and Physical Education
Television in Language Arts Education
Television in Mathematics Education
Television in Social Studies Education

Television in Higher Education: Social Work Education. NCSCT, 1966. .50 (ED 083 801)

One Week of Educational Television, Number 4. Morse Communication Research Center, Brandeis University and National Center for School and College Television, NCSCT, 1966* (ED 082 529)

Guidelines for Art Instruction Through Television for the Elementary Schools. NCSCT, 1967. $2.00

Television Guidelines for early Childhood Education. NITC, 1969. $2.00 (ED 040 739)

One Week of Educational Television, Number 5. National Education Television and the National Instructional Television Center, NITC, 1969. $2.50 (ED 029-501)

Continuing Public Education Broadcasting. NITC, September 1969. $3.50 (ED 038 042)

"Ready? Set . . . Go!"—A Preliminary Evaluation. NITC, 1969.*

The Analysis of Attention to a "Ripples" Encounter. NITC, 1970.*

Report of "Ripples" Evaluation Activities to the Consortium Members. NITC, July 1970. No Charge.

One Week of Educational Television, Number 6. National Instructional Television Center and the Corporation for Public Broadcasting, NITC, 1971. $2.50 (ED 050 572)

"Images & Things" Evaluation Report to Consortium Members. NITC, September 1971. No Charge.

Cause & Affect: Summary Report to the Contemporary II. NITC, March 1972.*

The "Inside/Out" Evaluation: The First Five Programs, Parts I and II. Bureau of Public Discussion, Indiana University, July 1972. $5.00 (ED 070 250 and ED 070 251)

"Ripples" Use: A Second-Year Survey. NITC, Fall 1972.*

"Images & Things" Content Analysis. North Texas State University, 1972.*

Research Report: "Inside/Out" Teacher's Guide Survey. NITC, May 1973.*

Consortium Agency Utilization and Promotion Activities for "Inside/Out." NITC, Fall 1973.*

Decision-Oriented Research in School Television. AIT, September 1973.* (ED 082 536)

"Ripples": A Third-Year Survey. AIT, December 1973. No Charge.

Research Memo: The Use of the "Inside/Out" Soundsheet. AIT, January 1974.*

Research Memo: Teachers' Opinions of "A Matter of Fact" Program Posters. AIT, August 1974.*

Report on Evaluation Activities of the "Bread & Butterflies" Project. Educational Testing Service and AIT, October 1974. $3.00 (ED 097 921)

Research Memo: Television/Film Series on Essential Learning Skills. AIT, October 1974.*

Preliminary Formative Evaluation Report: "Pressure Makes Perfect." AIT, April 1975.*

Preliminary Formative Evaluation Report: "Trying Times." AIT, August 1975.*

Formative Evaluation of "Self Incorporated" Programs (Research Report Number 30). AIT, January 1976. $5.00 (ED 119 712) Summary. (ED 119 711)

"Inside/Out" Teacher's Guide Survey (Research Report Number 31). February 1976. No Charge.

"Bread & Butterflies" Teacher's Guide Survey (Research Report Number 32) in preparation.

Technical Report: AITGRAF: The AIT Classroom Interaction Analysis Graphing Program (Research Report Number 33.) October 1976. No Charge.

Teachers' Opinions about the Viewer's Guide for The Parent Crunch *from "The Heart of Teaching" Series* (Research Report Number 34). March 1976. No Charge.

Formative Evaluation of "MeasureMetric" Program on Length (Research Report Number 35). May 1976.*

Research on the Format and Style of "The Heart of Teaching" Viewer's Guide (Research Report Number 36). September 1976. No Charge.

"Stories From 'Inside/Out'," Its Availability and Use (Research Report Number 37). June 1976. No Charge.

A Compilation of Instructional Television Series for Secondary School Use (Research Report Number 38). June 1976. No Charge.

Responses to the Essential Skills Television Project Orientation Program (Research Report Number 39). August 1976.*

An Evaluation of "The Heart of Teaching" Leadership Training Institute (Research Report Number 40). August 1976.*

Responses to the Questionnaire included in "The Essential Skills Television Project: A Working Document" (Research Report Number 41). September, 1976.*

Review of Economic Education Design Team Draft Reports (Research Report Number 42). September, 1976.*

A Survey of the Individual Program Teacher Guides for "Self Incorporated" (Research Report Number 43). November, 1976.

Formative Evaluation of Economic Project Television Scenarios: Part I (Research Report #44). December, 1976.

AITATTN: The AIT Attention Plotting Program (Research Report #45). January, 1977.

Affective Films for the Hearing Impaired Child: A Test of Captioned "Inside/Out" Programs (Research Report #46). April, 1977.

A Challenging Picture: The Status of ITV Utilization in Secondary Schools (Research Report #47). June, 1977.

Research on the Use of Television in Secondary Schools (Research Report #48). June, 1977.

Economic Education Consortium Script Review Procedures (Research Report #49). June, 1977.*

Formative Evaluation of "Trade-offs" Television Scenarios: Part II (Research Report #50). July, 1977.

School Television in the Archdiocese of New York (Research Report 51). July 1977.

The ITV Experience at Evanston Township High School (Research Report 52). July 1977.

An Experiment in Autonomy: Secondary School Television Use in Two Coastal Georgia Schools (Research Report 53). July 1977.

The Allegheny Educational Broadcasting Council: Instructional Television in Central Pennsylvania (Research Report 54). July 1977.

END